

Response Under 37 CFR 1.116

Expedited Procedure

Examining Group 1796

Application No. 10/539,789

Paper Dated: December 18, 2009

In Reply to USPTO Correspondence of August 18, 2009

Attorney Docket No. 4385-051182

REMARKS

Claims 25-34 and 37-48 are currently pending in this application. Claims 1-24, 35 and 36 have been cancelled, without prejudice.

Claim 25 has been amended to clarify that the process comprises, *inter alia*, increasing the concentration of the etherified melamine resin precondensate in a second vaporization step until the precondensate has a concentration from 95 to 99% by weight, and adding C₄-C₁₈ alcohols, diols of the type represented by HO-R-OH or tetrahydric alcohols based on erythritol or both is added to the melamine resin precondensate after the concentration-increase process from 95 to 99% by weight. This amendment is supported at least at page 5, lines 9-16 of the specification. No new matter has been added to the application by the foregoing amendment.

Claims 25-34, 37, and 39-48 have been rejected under 35 U.S.C. §103(a) as being obvious over Borner et al. (WO 02/40564 cited with equivalent U.S. 2004/0024131) in view of Adams et al. (U.S. Patent No. 2,473,463) and in further view of Michel et al. (U.S. Patent 4,271,286).

The Office Action alleges that Borner et al. teaches a direct synthesis process for preparing etherified melamine resin condensates wherein: a) in the first step of the reaction, an etherified melamine resin precondensate is prepared in alcoholic solution (methanol, See Example 1, allegedly meeting the limitations of claim 27 and claim 28) with formaldehyde (allegedly meeting the limitation of claims 29 and 31) at a temperature of 20-100°C (allegedly meeting the limitations of claim 34 and newly added claim 48); b) in the first step (see Example 1), the concentration of the etherified melamine resin precondensate in alcoholic solution is increased, C₄-C₁₈ alcohols (C₄ butanol, see Example 1); re-concentration of the product after addition of 2L of methanol, which allegedly can be considered as a second vaporization step (see Example 1); and c) in a second step of the reaction, the increased-concentration melamine resin precondensate is reacted, using a mixer (extruder, See Example 1).

Regarding the new limitation claiming alcohol addition after a concentration increasing step, the Office Action contends that Borner et al. teaches that in the first stage

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methanol distilled off and in the second stage butanol is added (See Example 1).

Regarding claim 26, the Office Action contends that Borner et al. teaches that after the second step of the reaction, the etherified melamine resin condensate is discharged and pelletized (granulated) (See Example 2). Regarding claims 29-30, the Office Action contends that Borner et al. teaches a process which takes place at pH of 6.5-9, preferably 7-8 (See line 0030). Regarding claims 41-42, the Office Action contends that Borner et al. teaches using a highly vented extruder (See claim 9). The Office Action contends that, although Borner et al. does not teach the details of the extruder, it would have been obvious to a person of ordinary skill in the art that it should have very effective vapor removal system, since harmful formaldehyde releases during the process. Regarding claim 43, the Office Action contends that Borner et al. teaches addition of up to 60% of particulate additives (See line 0040).

The Office Action acknowledges that Borner et al. does not teach a molecular weight of 500 to 50,000. However, the Office Action contends, the resulting resin is pelletized, which suggests that its molecular weight is at least 500.

The Office Action acknowledges that Borner et al. does not disclose any exact solid content after vaporization (i.e., before the extrusion). However, the Office Action contends, Borner et al. allegedly teaches that the resin obtained in stage (1) is both dried and procured in a double screw extruder at a temperature between 160 and 185°C (See Example 1, line 0046). The Office Action takes the position that the above conditions are sufficient to obtain dry resin having 95-99% solids. In fact, the Office Action contends, the boiling temperature of all ingredients is far below 160°C (highest boiling ingredient is butanol with boiling point of 118°C).

Also, in Example 2, the Office Action contends that Borner et al. discloses heating of the resin at 180°C for 2 hours in a vacuum (See line 0049). The Office Action notes that the present specification discloses heating of an etherified melamine at 90°C in a vacuum, producing a resin with 96% solids. (See Inventive Example 4, line 0115).

Therefore, the Office Action contends that the amount of solids in Borner et al.'s reference is expected to be within the claimed range, since the reference uses stronger heating

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conditions compared to those disclosed in the present specification. The Office Action contends that Borner et al. teaches addition of butanol after the neutralization step, which makes a transesterification process improbable. Therefore, the Office Action acknowledges, the Borner et al. polymer is not free from $\text{NH-CH}_2\text{-O-CH}_2\text{-NH}$, since methylol groups tend to react with each other. Also, the Borner et al. process has a disadvantage of releasing poisonous formaldehyde during the kneading process. Also, a product having longer alcohol chains allegedly has better elasticity.

In summary, the Office Action acknowledges that Borner et al. does not teach melamine resin condensates free from hydroxymethyleneamino groups bonded to the triazine rings of the melamine resin condensate and from $\text{-NH-CH}_2\text{-O-CH}_2\text{-NH-}$ groups linking triazine rings.

The Office Action contends that Adams et al. teaches a process for making a fully methylated melamine-formaldehyde composition, which is obtained by trans-etherification with butanol (See Examples, particularly Example 3), wherein the first step represents methylation with a subsequent etherification, alleging that the above process is well known in the industry because it allows preventing additional polymerization of formaldehyde to paraformaldehyde. The Office Action contends that Adams et al. teaches an etherification process at pH 5.5-6.5 (See column 4, line 65, meeting the limitations of claims 30 and 31) at 86-91°C (See column 6, line 15, meeting the limitations of claim 34) and melamine-formaldehyde ratio of 1:3 (see Example 3, meeting the limitation of claim 35). The Office Action alleges that Adams et al. teaches both simultaneous and sequential processes (see Examples) and an increased concentration of the condensate after vaporization of 10-85%. Regarding claim 33, the Office Action contends that Adams et al. discloses a process in the presence of ion-exchange resins (See Example 3). Regarding claim 37, the Office Action contends that Adams et al. teaches two step distillation (See Examples). In reference to claim 40, the Office Action contends that Adams et al. teaches addition of acid-modified butanol (See Examples). Therefore, the Office Action argues, it would have been obvious to a person of ordinary skill in the art to modify Borner et al.'s process with Adams et al., since it would lead to a safer process (no poisonous gas releases during the

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extrusion) and create a product with better mechanical properties (i.e., elasticity). In addition, Adams et al.'s process allegedly prevents forming a by-product (polyparaformaldehyde), which can deteriorate the performance of the target composition.

The Office Action acknowledges that Borner et al. and Adams et al. do not teach a limitation of claim 25, which claims solid content of etherified precondensate in alcoholic solution within the range of 65-85% wt.

The Office Action contends that Michel et al. teaches a process for preparation of methyloltriazines etherified with alkanols. In particular, the Office Action alleges that Michel et al. teaches reaction of melamine, formaldehyde and methanol with a following evaporation step, where solid content of the reaction product is 75% wt (see Example 1). Michel et al.'s process allegedly allows achieving high storage stability of the resulting precondensate along with economical advantages. The solid content of Michel et al.'s product allegedly is low enough for undesirable crystallization of the precondensate and high enough for handling of the solution (i.e., transportation, piping, etc.) (See column 1, line 65). The Office Action contends that, in addition, this step is advantageous for economical reasons because having highly concentrated melamine resin requires lower apparatus volume, needed for further pre-concentration before the extrusion step, a lower amount of material is much easier to handle, and evaporating less solvent requires less demanding drying equipment. For instance, a composition having 75-85% of resin content represents solid mass requires only a heater with metal pane with venting, whereas a liquid composition requires a vacuumed reactor with stirrer. Therefore, the Office Action contends, it would have been obvious to a person of ordinary skills in the art to pre-concentrate melamine resin to 65-85% to achieve a solid state material to provide a more economical and technologically sound process.

In the Response to Arguments section at pages 9-10 of the Office Action, it is noted that Applicants submit that "none of the above-cited documents, taken alone or combined as set forth in the Office Action, suggests or discloses: (1) a two step vaporization process for concentrating the etherified melamine resin precondensate up to a concentration of 99 wt%, or (2) the addition of a diol for transesterification after the concentration-increase process". The

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Office Action disagrees. *Regarding (1), the Office Action acknowledges that Borner et al. does not disclose any exact solid content after vaporization (i.e., before the extrusion).* However, the Office Action contends, Borner et al. teaches that the resin obtained in stage (1) is both dried and procured in a double screw extruder at temperature between 160 and 185°C (See Example 1, line 0046). The position is taken that the conditions above allegedly are sufficient to obtain dry resin having 95-99% solids. The Office Action contends that the boiling temperature of all ingredients is far below 160°C (highest boiling ingredient is butanol with a boiling point of 118°C). Also, the Office Action contends that, in Example 2, Borner et al. discloses heating of the resin at 180°C for 2 hours in a vacuum (see line 0049). The Office Action notes that the present specification discloses heating of an etherified melamine at 90°C in a vacuum, producing a resin with 96% solids, referring to Inventive Example 4, line 0115. Therefore, the Office Action concludes, the amount of solids in Borner et al.'s reference is expected to be within the claimed range, since the reference uses stronger heating conditions compare to the present specification.

Regarding the new limitation claiming alcohol addition after a concentration increasing step (2), the Office Action contends that Borner et al. teaches that in the first stage methanol is distilled off and in the second stage butanol is added, referring to Example 1.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

As reiterated by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 82 U.S.P.Q.2d 1385 (2007), the framework for the objective analysis for determining obviousness under 35 U.S.C. §103 is stated in *Graham v. John Deere*. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg., No. 195 (October 10, 2007) at page 57527 (hereinafter "Examination Guidelines"). The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art; and
- (3) Resolving the level of ordinary skill in the pertinent art.

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Examination Guidelines at page 57527.

When an Applicant timely submits evidence traversing a rejection, the Examiner must reconsider the patentability of the claimed invention. M.P.E.P. §716.01(d). The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence. M.P.E.P. §716.01(d), *citing In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of a *prima facie* case was reached, not against the conclusion itself. M.P.E.P. §716.01(d), *citing In re Eli Lilly*, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990). In other words, each piece of rebuttal evidence should not be evaluated for its ability to knockdown the *prima facie* case. M.P.E.P. §716.01(d). All of the competent rebuttal evidence taken as a whole should be weighed against the evidence supporting the *prima facie* case. M.P.E.P. §716.01(d), *citing In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

Present claim 25 relates to a direct synthesis process for preparing etherified melamine resin condensates with weight-average molecular weights from 500 to 50,000, the melamine resin condensates are free from hydroxymethylamino groups bonded to the triazine rings of the melamine resin condensate and from $\text{-NH-CH}_2\text{-O-CH}_2\text{-NH-}$ groups linking triazine rings, wherein

a) in the first step of the reaction, an etherified melamine resin precondensate is prepared from melamine and formaldehyde in alcoholic solution, whereby the molar ratio of melamine to formaldehyde is 1:2 to 1:4,

b) the concentration of the etherified melamine resin precondensate in alcoholic solution is increased in a first vaporization step until the solids content of the etherified melamine resin precondensate is from 65 to 85% by weight,

c) the concentration of the etherified melamine resin precondensate is increased in a second vaporization step until the precondensate has a concentration from 95 to 99% by weight,

d) $\text{C}_4\text{-C}_{18}$ alcohols, diols of the type represented by HO-R-OH or tetrahydric alcohols

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based on erythritol or both is added to the melamine resin precondensate after the concentration-increase process from 95 to 99 % by weight, and

e) in a second step of the reaction, the increased-concentration melamine resin precondensate is reacted using a mixer, such as a kneader.

Borner et al. discloses the synthesis and processing of 2,4-diamino-1,3,5-triazine aldehydes resins. Substituted 2,4-diamino-1,3,5-triazines are reacted with an aldehydes, such as formaldehyde, to form unetherified aldehyde-triazine resins in a basic environment. In a second step, the unetherified resin is then etherified with a C₁-C₁₂ alcohol under acidic conditions (see paragraph [0023]). Such obtained resins are only partially etherified and still contain —NH-CH₂-O-CH₂-NH- groups. The excess alcohol is removed by distillation, thus increasing the concentration of the etherified resin (see Example 1).

Adams discloses a process for preparing of liquid alkylated melamine-formaldehyde compositions by reacting methanol, melamine and formaldehyde in a first step and transesterifying the obtained condensate with propanol or butanol in a second step (See column 1, lines 10-30, example 3-5). Only after the final product in the form of a liquid composition is obtained is the product concentrated or diluted to yield products comprising 10-85 wt% of resin (column 5, lines 1-5, Examples 3 and 5).

Michel et al. discloses a process for the preparation of etherified methylolaminotriazines by reacting melamine as aminotriazine and formaldehyde in NaOH solution followed by etherification with an alkanol, e.g., methanol in acidic conditions. The etherified melamine is concentrated to a solids content of 75 wt% (column 4, line 41, Example 1).

Thus, none of the above-cited documents, taken alone or combined as set forth in the Office Action, suggests or discloses:

(1) a two step vaporization process for concentrating the etherified melamine resin precondensate up to a concentration of 99 wt%, or

(2) the addition of a diol for transesterification after the concentration-increase process.

In response to the allegations in the Office Action, Applicants submit herewith the

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Declaration under 37 C.F.R. §1.132 of Mr. Markus Machherndl (hereinafter "Declaration"). Mr. Machherndl is an expert of the subject matter disclosed and claimed in the present patent application, U.S. Patent Application Serial No. 10/539,789. Declaration at paragraph 1.

Mr. Machherndl received a Master's degree in Chemistry from TU Graz (Austria) in 1998 in the field of Chemical Engineering. Declaration at paragraph 1. Since then, Mr. Machherndl has been working in Research and Development departments. Declaration at paragraph 1. Mr. Machherndl has been working for 6 years in the field of flame retardancy of polypropylene with melamine based flame retardants (2 Patents), and development of new products based on melamine resin chemistry like resins for WPC application, injection moulding application, SMC-application and fibre application. Declaration at paragraph 1. This was followed by 3 years of research in the field of scale up of lab-processes into pilot plant size. Declaration at paragraph 1.

For the last 1.5 years, Mr. Machherndl has been working in the area of down scaling C₂ to C₄ hydrocarbons (ethylene, propylene, butene). Declaration at paragraph 1. Mr. Machherndl's actual working field includes pilot plant operations, process development of metathesis of ethylene and 2-butene, dimerisation of ethylene, and dehydrogenation, as well as further development of the existing fibre process of melamine resins. Declaration at paragraph 1.

Mr. Machherndl is employed by Borealis Polyolefine GmbH, which together with Borealis Agrolinz Melamine GmbH are part of the group Borealis AG. Declaration at paragraph 1. The assignee of the present application, namely AMI - Agrolinz Melamine International GmbH, also is part of the group Borealis AG. AMI - Agrolinz Melamine International GmbH has been renamed Borealis Agrolinz Melamine GmbH.

Mr. Machherndl is a designated inventor of a number of patents and/or patent applications including US 2006/0100317 A1, US 7,196,131 B2, US 7,012,108 B2, AT 411.902, EP 1 603 969 B2, EP 2 044 135 A1, WO 2009/027385 A1 and US 2008/0227889 A1. Declaration at paragraph 1.

Mr. Machherndl has reviewed the above-identified patent application, the pending claims thereof, the Office Action of August 18, 2009 and cited references, including the

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rejections of: claims 25-34 and 37-48 under 35 U.S.C. §103(a) as being obvious over U.S. Patent Publication No. 2004/0024131 A1 ("Borner et al.") in view of U.S. Patent No. 2,473,463 ("Adams") and U.S. Patent No. 4,271,286 ("Michel et al."), and claim 38 as being obvious over Borner et al. in view of Adams and Michel et al., further in view of U.S. Patent No. 5,206,066 ("Horacek") as set forth in the Office Action for the above-identified patent application.

Declaration at paragraph 2.

Mr. Machherndl has reviewed and considered the cited prior art as set forth in the Office Action, and believes that none of the cited prior art, combined as set forth in the Office Action, discloses or suggests a process such as that of present claim 25 comprising, *inter alia*, further concentrating a pre-condensate up to 95-99 wt% in a second vaporization step, and adding a C₄-C₈ alcohol, diols or tetrahydric alcohols to the concentrate after the second vaporization step. Declaration at paragraph 2.

Mr. Machherndl is familiar with the disclosure of Borner et al. Declaration at paragraph 3. According to Mr. Machherndl, Borner et al. discloses a synthesis process comprising the following steps:

- synthesis of an unetherified melamine resin,
- etherification of the melamine resin with methanol under acidic conditions,
- stabilisation of the formed resin by adding a base in MetOH or desaltification by adding butanol,
- procuring the resin in an extruder. Declaration at paragraph 3.

A specific process is described in Example 1 of Borner et al., having the steps of:

- a) forming an etherified melamine resin pre-condensate (melamine, formaldehyde, methanol) and neutralising the pre-condensate solution with KOH in methanol,
- b) concentrating the pre-condensate by distilling off 7 l methanol,
- c) adding 2 l butanol for salt precipitation, and
- d) re-concentrating the resin, and
- e) reaction in an extruder. Declaration at paragraph 3.

The order of the above steps can thus be summarized as etherification -

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concentration - alcohol addition - concentration - extruder reaction. Declaration at paragraph 3.

The resins of the Borner et al. process can be processed as a melt, have softening points of above 100 °C and are curable above 240 °C. Declaration at paragraph 3. Furthermore, the obtained resins are not free of hydroxymethylene-amino groups and NH-CH₂-O-groups, as already has been acknowledged by the Office Action. Declaration at paragraph 3.

In contrast to Borner et al., the present claim 25 is directed to a process for preparing etherified melamine resins with weight-average molecular weights from 500 to 50,000 free from hydroxymethyleneamino groups bonded to the triazine rings of the melamine resin condensate and from -NH-CH₂-O-CH₂-NH-groups linking triazine rings comprising the following steps:

- a) forming an etherified melamine resin pre-condensate (melamine, formaldehyde, alcohol),
- b) concentrating the pre-condensate up to 65-85 wt% in a first vaporization step,
- c) further concentrating the pre-condensate up to 95-99 wt% in a second vaporization step,
- d) adding a C4-C8 alcohol, diols or tetrahydric alcohols to the concentrate after the second vaporization step, and
- e) reacting the mixture in an extruder. Declaration at paragraph 4.

The order of the steps according to present claim 25 can thus be summarized as follows: etherification - 1st concentration - 2nd concentration - alcohol addition for transesterification - extruder reaction. Declaration at paragraph 4.

Thus, the present claim 25 differs in the order of the process steps from the teaching of Borner et al. The most striking difference is that in claim 25, the addition of alcohols to a precondensate with a concentration of 95 to 99 wt% after the concentration has been completed. Declaration at paragraph 4.

Assuming arguendo that a person skilled in the art would even recognize the re-concentration step in example 1 of Borner et al. as the second vaporization step, then the addition of butanol as alcohol in step c) according to Borner et al. is definitely carried out before this second vaporization step. Declaration at paragraph 4.

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It is also to be pointed out, that the pH mentioned in paragraph [0030] of Borner et al. does not refer to the pH as applied in an etherification process, i.e., methylolation and etherification of the melamine-formaldehyde resin, but rather to the stabilisation process of the etherified resin. Declaration at paragraph 4. This is a different step in the overall synthesis process, in contrast to the statement by the Office Action on page 3, 5th paragraph of the Office Action. Declaration at paragraph 4.

Furthermore, the conclusion by the Office Action on page 4, 2nd paragraph of the Office Action that the pelletized resin suggests a Molecular weight of at least 500 lacks a technical basis. Declaration at paragraph 4. It is not possible to assume a certain molecular weight of a resin from the fact that a resin can be pelletized. Declaration at paragraph 4. For example, pelletized resins with very low molecular weights (< 200 g/mol corresponding to 1 mol Melamine and 1-2 mol formaldehyde) are known. Declaration at paragraph 4. On the other hand, high molecular weight resins with molecular weights of > 2000 g/mol can be liquid or pasty which can by no means be present in any pelletized form. Declaration at paragraph 4.

Furthermore, the Office Action states on page 4 of the Office Action that Borner et al. does not disclose any solid content after vaporization. Declaration at paragraph 4. However, the Office Action argues that the temperature conditions in the extruder between 160 and 185°C according to Borner et al. are sufficient to obtain a dry resin having a solid content of 95 to 99 wt%. Declaration at paragraph 4. In Mr. Machherndl's opinion, he kindly disagrees with the Office Action's contention that the temperature conditions in the extruder between 160 and 185°C according to Borner et al. are sufficient to obtain a dry resin having a solid content of 95 to 99 wt%. Declaration at paragraph 4.

According to the present process, the highly concentrated melt is still meltable and in a non-cured state after the 2nd vaporization step. Declaration at paragraph 4. Only the temperature conditions in the extruder in the final process provide a cured resin. Declaration at paragraph 4. Thus, the temperature conditions in the extruder according to Borner et al. cannot serve for arguing that a highly concentrated resin in the first reaction steps is present before alcohol addition and before extrusion. Declaration at paragraph 4. On the contrary, if only after

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the treatment in the extruder a dry and highly concentrated resin is obtained (according to the Office Action's arguments), this would then mean that the resin must have been less concentrated before the treatment in the extruder. Declaration at paragraph 4. In contrast, according to the present process, a highly concentrated resin is already obtained before the extrusion process and not during the extrusion process. Declaration at paragraph 4. Hence, the resin according to Borner et al. must imperatively be different to the resin obtained by the present process. Declaration at paragraph 4.

Adams describes a synthesis process comprising the following steps:

- synthesis of a melamine formaldehyde precondensate with low formaldehyde content
- etherification of the melamine resin with methanol and simultaneous alcohol distillation,
- concentration of resin by heating,
- trans-etherification with butanol and/or propanol and simultaneous alcohol distillation
- concentration of resin by heating up to 85% of solids content. Declaration at paragraph 5.

Example 3 (column 6, starting line 56 of Adams) describes for instance the following process:

- mixing of melamine and formaldehyde with not more than 3.5 mole formaldehyde per mole of melamine,
- continuous addition of methanol under simultaneous distillation of alcohol and water providing an etherified resin,
- continuous addition of n-butanol under simultaneous distillation of alcohol and water providing an transesterified resin,
- heating the mixture under reduced pressure for concentration of the liquid resin.

Declaration at paragraph 5.

Thus, only after the final product in the form of a liquid composition is obtained said product might be concentrated to yield products comprising 10-85 wt% of resin (column 5, lines 1-5, Examples 3 and 5). Declaration at paragraph 5. Adams does also not disclose that an alcohol is added after two resin concentration steps, in contrast to the presently claimed

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invention. Declaration at paragraph 5.

The order of reaction steps according to Adams is therefore: etherification - alcohol addition - transesterification - concentration. Declaration at paragraph 5.

The process of Adams provides a liquid etherified melamine resin with low formaldehyde content, which is usable as lacquer, varnish, for films, coatings or impregnation (column 9, lines 15-22 of Adams). Declaration at paragraph 5.

In Mr. Machherndl's opinion, the general teaching of Adams is that an etherification or trans-etherification reaction of a melamine formaldehyde resin with low formaldehyde content only works successfully in good yields by distilling the excess alcohol and water simultaneously to the alcohol addition. Declaration at paragraph 5. As the distillation proceeds, the alcohol has to be added from time to time until completion. Declaration at paragraph 5. Hence the "two step"- distillation (see Office Action's comment on page 6 of the Office Action) in the Adams process does not serve to increase the concentration of the melamine resin but rather serves to promote the etherification reaction and subsequently the trans-etherification reaction. Declaration at paragraph 5.

In Mr. Machherndl's opinion, a person skilled in the art would not consider Adams when looking for a process as to how to produce melt processable melamine formaldehyde resins, since Adams deals solely with liquid aqueous resin solutions usable in lacquer and coating industry. Declaration at paragraph 5.

If, nevertheless, a person skilled in the art would consider the teaching of Adams for modifying the resins, in Mr. Machherndl's opinion he/she still would not arrive at the present synthesis process. Declaration at paragraph 5. Although it is correct that Adams discloses fully etherified (and trans-etherified) melamine formaldehyde resins with low formaldehyde content free of hydroxymethyleneamino groups and NH-CH₂-O-groups, Adams – as in Borner et al. - does not disclose a two step resin concentration up to 95-99 wt% resin content with subsequent addition of the alcohol such as is presently claimed. Declaration at paragraph 5.

Michel et al. describes a two step synthesis process for production of alkanol etherified melamine formaldehyde resins in which the extent of the etherification is 30 to 60%,

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having the following steps:

- reaction of melamine with formaldehyde and water and 0-30 wt% of an alkanol at 60-90°C and pH = 8-11, then
- addition of the remaining alkanol at 80-130°C and pH = 3-7 in presence of strong acids providing an etherified resin, then
- concentration of the resin up to a solids concentration of 75 wt%. Declaration at

paragraph 6.

The order of reaction steps according to Michel et al. is therefore: methylation-alcohol addition -etherification - concentration. Declaration at paragraph 6.

The process of Michel et al. provides liquid etherified melamine resins with good compatibility with organic binders, low viscosity, good reactivity and storage stability, which is usable as lacquer, varnish for coatings, adhesives or laminates. Declaration at paragraph 6.

In Mr. Machherndl's opinion, Michel et al. is solely directed towards liquid aqueous resin solutions usable in the lacquer and coating industry. Declaration at paragraph 6. Therefore, a person skilled in the art would not consider Michel et al. when looking for a method for producing melt processable melamine formaldehyde resins. Declaration at paragraph 6.

Michel et al. (equally to Borner et al. and Adams) does not disclose a two step vaporization process for obtaining a resin with a concentration of 95 to 99 wt% and a subsequent alcohol addition, such as is presently claimed. Declaration at paragraph 6. As shown in the examples of Michel et al., the concentration increase of the final resin is carried out only after completion of the etherification reaction, hence after the whole amount of the alkanol has been added to the mixture and after the reaction mixture already has been cooled down from reaction temperature. Declaration at paragraph 6. Furthermore, the maximum resin concentration disclosed by Michel et al. is only 75 wt%. When considering the teaching of Michel et al., one skilled in the art would come to the conclusion that it is not even desirable to produce a resin with a still higher solids concentration. Declaration at paragraph 6. As shown in column 2, line 35 of Michel et al., only products with a preferably low viscosity are desired. Declaration at

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paragraph 6. Since it is common knowledge that by increasing the solids content the viscosity of the resin also increases, the teaching of Michel et al. even leads the expert away from the invention. Declaration at paragraph 6.

The Office Action's argument at page 7 of the Office Action is not pertinent to the desired use of the resin. Declaration at paragraph 6. In the special technical field of the invention - namely production of melt processable melamine resins- the advantages of a high solids content are beyond doubt (see also below). Declaration at paragraph 6.

The Office Action is of the opinion that it would have been obvious to a person skilled in the art to obtain a 95-99 wt% melt of etherified melamine resin precondensate over Borner et al. in view of Adams and Michel et al. Declaration at paragraph 7. Mr. Machherndl kindly disagree. Declaration at paragraph 7.

In Mr. Machherndl's opinion, increasing the concentration of a precondensate melt over 85 wt%, especially up to 95-99 wt%, is **not** a trivial and obvious process. Declaration at paragraph 7. In order to obtain a melt having a concentration over 85 wt%, various technical aspects have to be considered. Declaration at paragraph 7. The concentration process is in general accompanied by an extreme foam formation and viscosity increase. Declaration at paragraph 7. Therefore, the first vaporization step is carried out in a thin-film vaporizer with a rotational speed of 1400 U/min which is applicable for melts having low viscosities. Declaration at paragraph 7.

In the second vaporization step, however, only a vaporizer with a lower rotational speed of 400 U/min can be applied. Declaration at paragraph 7. Such a slow vaporizer acts as a foam breaker and thus allows a further concentration of the melt up to 95-99 wt%. Declaration at paragraph 7. At the exit of the second vaporizer the melt is almost free of solvent. Declaration at paragraph 7. This is also absolutely required for the further work up of the melt in the extruder. Declaration at paragraph 7. Otherwise the melt would not reach the reaction temperature above 200°C in the extruder in a timely manner required for the build up of the molecular weight. Declaration at paragraph 7.

This means, in reverse, if the second vaporization step is omitted and the melt

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enters the extruder only with a concentration of less than 85 wt% (or 75 wt% according to Michel et al.) repeated solvent evaporation occurs in the extruder. Declaration at paragraph 7. This in turn would cause a delay of the temperature increase to the required reaction temperature in the extruder. Declaration at paragraph 7. This also would require more energy and extruders with an enormous length in order to obtain the required residence time. Declaration at paragraph 7.

Thus, Mr. Machherndl concludes, is **not** obvious for a person skilled in the art to obtain melt with concentrations higher than 85 wt%. Declaration at paragraph 7. This can also be deduced from the fact that none of the cited references discloses a melt having a concentration above 85 wt%. Declaration at paragraph 7.

The advantages of adding an alcohol for transesterification after the concentration-increase process are as follows: After the second concentration step the melt exists as a syrupy melt with a concentration of up to 99 wt%. Declaration at paragraph 7. The paste is metered via a feeding pump and a feeding line into the extruder (or kneader) where the molecular mass built up and procuring occurs. Declaration at paragraph 7. By adding the alcohol to the melt at this stage the viscosity of the syrupy melt is decreased. Declaration at paragraph 7. This in turn reduces the adhesion of the melt to the wall of the feeding line and therefore the transport of the melt in the feeding line is improved. Declaration at paragraph 7.

Furthermore, the addition of the alcohol to the highly concentrated melt also lubricates the feeding pump so that the addition of an otherwise necessary lubricant is avoided, e.g., the addition of graphite as lubricant would decrease the procuring and product quality. Declaration at paragraph 7. If the alcohol would be added **before** the second vaporization step the addition of a lubricant would be required. Declaration at paragraph 7.

A good mixing of the syrupy melt and the alcohol is achieved by metering the alcohol into slot of the sliding ring of the gear wheel feed pump. Declaration at paragraph 7. If the alcohol is added at a different process step, e.g., before the second vaporization step, a static mixer would be required in order to obtain a good mixing result. Declaration at paragraph 7. Static mixers however are characterized by certain dead zones which can promote blocking in

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the feed line between the feeding pump and the extruder. Declaration at paragraph 7.

Furthermore, the addition of colder alcohol to the melt having a temperature above 120°C effects a cooling of the melt. Declaration at paragraph 7. Cooling is desirable since it promotes foam breaking. Declaration at paragraph 7. However, the cooling effect is so marginal that a fast heating of the melt in the extruder is not hampered. Declaration at paragraph 7.

Thus, the combination of Borner et al. Adams and Michel et al. does not suggest or disclose a two step vaporization process for obtaining a resin with a concentration of 95 to 99 wt% and a subsequent alcohol addition, such as is presently claimed.

For at least the foregoing reasons, claims 25-34, 37, and 39-48 are not obvious over Borner et al. in view of Adams et al. and in further view of Michel et al., combined as set forth in the Office Action. Accordingly, Applicants respectfully request reconsideration and withdrawal of the foregoing rejection.

Claim 38 has been rejected under 35 U.S.C. §103(a) as being obvious over Borner et al. in view of Adams et al. and Michel et al., as applied to claims 25-34, 37, 39-48 above, and further in view of Horacek (U.S. Patent No. 5,206,066) (herein "Horacek"). *The Office Action acknowledges that Borner et al., Adams et al. and Michel et al. do not teach diol as etherification agent.* The Office Action alleges that Horacek discloses a melamine-formaldehyde resin, modified with diol (see Abstract and column 2, line 30), such as 1,4 butane diol. The Office Action alleges that the advantage of the Horacek resin is that it exhibits low shrinkage during curing and good mechanical properties (high flexibility) (see column 1, line 30). Therefore, the Office Action contends, it would have been obvious to a person of ordinary skills in the art to use diols in the Borner/Adams processes in order to achieve low shrinkage during curing and high flexibility.

In the Response to Arguments section at pages 9-10 of the Office Action, the Office Action notes that, with respect to the cited combination of references including Horacek, Applicants argue that the reference teaches high formaldehyde content, but does not disclose two vaporization steps and order of alcohol addition. The Office Action disagrees, arguing that all of

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the above steps are disclosed in the primary references (Borner et al.), Adams et al. and Michel et al. Horacek allegedly is applied only for the purpose of teaching diol as an etherifying agent.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

As discussed in detail above, the combination of Borner et al., Adams and Michel et al. does not suggest or disclose a two step vaporization process for obtaining a resin with a concentration of 95 to 99 wt% and a subsequent alcohol addition, such as is presently claimed.

Horacek does not cure this deficiency in the recited combination of Borner et al., Adams and Michel et al. Horacek discloses melamine resins obtained by a process of mixing etherified melamine-formaldehyde resins with diols until a certain viscosity is reached (see Example 1). The resin is characterized by high formaldehyde content. In contrast to Horacek, the present process uses a lower melamine/formaldehyde ratio of 1:2 to 1:4.

Horacek does not suggest or disclose a two step vaporization process for obtaining a resin with a concentration of 95 to 99 wt% and a subsequent alcohol addition, such as is presently claimed 25.

Furthermore, in contrast to Horacek, the presently claimed invention does not relate to pelletizing but rather to melt solidification using a double roller and breaking of the particles. In the process of melt solidification, the melt is cooled from 130°C to lower than 40°C by pressing the melt to a disc and thus increasing its surface. The disc is broken down in large pieces followed by its conversion to bulk material. The bulk material is suitable for gravimetric solid metering. Pellets according to Horacek, however, are not suitable for this purpose.

Thus, the process according to amended claim 25 would not be obvious to a person skilled in the art in view of the disclosures of Borner et al. in view of Adams and Michel et al., and further in view of Horacek. Claim 38 depends from claim 25, and is distinguishable from the cited references for at least the same reasons as those set forth above with respect to claim 25.

For at least the foregoing reasons, claim 38 is not obvious over Borner et al. in view of Adams et al. and in further view of Michel et al. and Horacek, combined as set forth in

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the Office Action. Accordingly, Applicants respectfully request reconsideration and withdrawal of the foregoing rejection.


Conclusion

It is believed that any pending rejections have been addressed. However, the absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

For at least the foregoing reasons, Applicants believe that claims 25-34 and 37-48 are in condition for allowance. Reconsideration of the rejections and allowance of pending claims 25-34 and 37-48 are respectfully requested.

Respectfully submitted,

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